



US005609694A

**United States Patent** [19][11] **Patent Number:** **5,609,694****Asai**[45] **Date of Patent:** **Mar. 11, 1997**[54] **SOLAR CELL AND A METHOD OF MANUFACTURING THEREOF**[75] Inventor: **Masahito Asai**, Nara, Japan[73] Assignee: **Sharp Kabushiki Kaisha**, Osaka, Japan[21] Appl. No.: **428,869**[22] Filed: **Apr. 25, 1995**[30] **Foreign Application Priority Data**

Apr. 28, 1994 [JP] Japan ..... 6-091443

[51] **Int. Cl.**<sup>6</sup> ..... **H01L 31/06**; H01L 31/18[52] **U.S. Cl.** ..... **136/255**; 136/244; 136/256;  
136/261; 257/463; 257/465; 437/2[58] **Field of Search** ..... 136/244, 255,  
136/256, 261; 257/463, 465; 437/2-5[56] **References Cited****FOREIGN PATENT DOCUMENTS**

56-60075 5/1981 Japan .

58-101471	6/1983	Japan	.....	136/255
59-27579	2/1984	Japan	.....	136/256
59-94883	5/1984	Japan	.	
2-33980	2/1990	Japan	.	
3-24768	2/1991	Japan	.	
3-62031	9/1991	Japan	.	
4-42974	2/1992	Japan	.	
5-75148	3/1993	Japan	.....	136/256
5-110121	4/1993	Japan	.	

*Primary Examiner*—Aaron Weisstuch[57] **ABSTRACT**

A solar cell includes a first n<sup>+</sup> type layer formed on the upper surface of a p type silicon substrate, a p type layer formed on the back surface of the substrate and having a dopant impurity concentration higher than that of the substrate, and a second n type layer formed at least on the edge face of the substrate so as to connect the first n type layer and the p type layer. The second n type layer has an impurity concentration lower than that of the first n<sup>+</sup> layer proximate the region in contact with the p type layer.

**8 Claims, 25 Drawing Sheets**